Towards strategic use of nursing information in the Netherlands

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10. Summary, Conclusion, Contributions and Recommendations

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10.1 Introduction

In this chapter a summary of the thesis is presented. For every research objective as formulated in the introduction, it is discussed to what extent it has been achieved, followed with general conclusions. After that, the contribution of the thesis to the field of nursing informatics and to the practice of nursing with respect to the use of electronic information systems is discussed. Finally, methodological remarks and recommendations for future research and development are presented.

10.2 Summary: the extent to which the research objectives are met

The nursing profession in the Netherlands could benefit from the application of information and communication technology to support its communication, patient care documentation, and data collection tasks, and to strategically use this information. The rationale for defining different information-needs in the nursing profession, at both clinical and aggregate levels, is that this allows to further structure and enhance information management in the profession. Nursing data, once entered in an electronic patient record can be used for purposes like research, management and policy making.
The general goal of the reviews and research described in this thesis is to analyse the problems associated with information management and the use of information and communication technology in nursing. Based on this analysis, three tools are developed that allow addressing these problems, criteria for nursing information systems, a nursing information reference model, and a nursing minimum data set. The following eight research objectives have been specified and are addressed in the thesis.

Objective 1 ***Analyse problems that are related to professional information management and the use of information and communication technology in nursing.***

Chapter two analyses the problems that exist in nursing information management and in the development and use of information and communication technology in nursing. These problems include:
Negative influences of information systems on nursing practice and on the identity of nurses;
Lack of adequate nursing terminology and classifications;
Limited collaboration between nurses and other disciplines in developing electronic patient records;
Current nursing information systems are inadequate;
Nursing informatics education is not available at most schools of nursing;
There is limited evidence for the benefits of nursing information systems;
Lack of systematic research in nursing informatics;
Lack of tools to assist in the development of nursing information systems.
To solve the problems, suggestions are presented in the next chapters.

Objective 2 ***Create a well-defined, systematic and scientific approach to the further advancement and development of the field of nursing informatics.***

A systematic and scientific approach is suggested for further developments in nursing informatics. The domain of nursing informatics is defined and scientific methods are suggested:
Nursing informatics is the multi-disciplinairy scientific endeavor of analyzing, formalizing and modeling how nurses collect and manage data, process data into information and knowledge, make knowledge-based decisions and inferences for patient care, and use this empirical and experiential knowledge in order to broaden the scope and enhance the quality of their professional practice. The scientific methods central to nursing informatics are focused on: (1) using a discourse about motives for computerized systems, (2) analyzing, formalizing and modeling nursing information processing and nursing knowledge for all components of nursing practice: clinical practice, management, education and research, (3) investigating determinants, conditions, elements, models and processes in order to design, and implement as well as test the effectiveness and efficiency of computerized information, (tele)communication and network systems for nursing practice, and (4) studying the effects of these systems on nursing practice.

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A theoretic framework illustrates the key areas of interest in the discipline, which are: the management and processing by nurses of data, information and knowledge to make appropriate decisions, deliver quality care, and evaluate its results. In addition, methods for conducting investigations regarding analysis, modelling and development of nursing information systems are described.

Objective 3 Gain consensus about the Nursing Information Reference Model and determine criteria for the systematic development, implementation and use of nursing information systems that are part of the electronic patient record.

An international panel of 36 experts established criteria for the development and use of electronic patient records in nursing. Use of the Delphi method allowed the construction of a coherent set of criteria in four main areas: communication, organisation, nursing, and technique. Also, the building blocks of the Nursing Information Reference Model were validated. These include several data layers [1]:

1. Atomic level patient data such as observations;
2. Clinical conclusions based on decision making such as the nursing diagnoses, interventions and outcomes;
3. Aggregated information to support management decisions;
4. Further aggregated information to support decisions with respect to nursing by policy makers.

Documenting patient data in the electronic patient record according to the nursing process and based on the 'enter once - use many times' principle, allows data use for other purposes, such as decision support via different presentations of the same data, and for the collection of a Nursing Minimum Data Set. Applying unified nursing terminology is another requirement to achieve this.
These criteria are useful to assist nurses in decision-making concerning the development of electronic patient records. In addition, several criteria allow the establishment of an information policy that reflects nursing care. Particular criteria include the recommendations for adequate human communication during development and use of the electronic patient record. The most important criterion however, is that the nursing information system should be an integral part of the multi-disciplinary electronic patient record, allowing data communication and collaboration between professionals for the benefit of the patients.
Two issues remain after this study. Nurses do not automatically accept control by management when this control is based on data from the electronic patient record. This issue should be addressed very carefully. A possible approach is the use of

discourses about system development. The goal could be to achieve agreement about what is allowed and what not with respect to data use.
There was no consensus about the suggested criterion of letting patients entering their own data into the nursing record. All kinds of objections were presented, such as control over the data quality, legal issues, unified terminology, and not being able to take responsibility for the content of the records.

Objective 4 Identify the implications of formalised nursing knowledge systems for the development of electronic patient records.

Because it was considered a requirement for the electronic patient record, the developments in formalisation of nursing knowledge, terminologies and classification systems were reviewed. The initiatives discussed in this review include nursing terminology projects in several countries and the International Classification for Nursing Practice. For many years it has been argued that nursing information systems were difficult to develop because of lacking terminology and classification systems. However, it is obvious that the current nursing language and classification systems can facilitate documenting patient care in electronic patient records.
A master index of nursing terminologies that permits comparing terms from different classification systems could be used for the nursing component in an electronic patient record. If this is realised, health care settings will be able to use their own terminology and classification system and still be able to compare their data with other data sets.
Practical implications of a formalised nursing language include the identification of data that are used during the clinical reasoning of nurses. The results of such studies are important for the layout and structure of data entry and data presentation on computer screens. In addition, the results will also show what nursing data and knowledge should be available in the system. Another example is that the co-operation between disciplines can be supported when their respective data management activities are integrated into one system.
One specific concern is that electronic patient records should allow for updating of the nursing terminology and classifications, without compromising the data-integrity of existing data in the system.

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Objective 5 ***Identify relevant patient data and data about nursing phenomena and nursing activities that are useful to get insight in nursing care.***

In chapter four the relevant patient data for nursing are identified, alongside the provider and institutional data of value as contextual information for decision making. A Nursing Minimum Data Set is one component of the Nursing Information Reference Model, and it is situated at the level where it assists in collecting and aggregating the relevant information for decision making by nursing management, and policy makers. The nursing community seems to agree about the value of a Nursing Minimum Data Set. Therefore, existing systems were reviewed regarding their relevance for similar developments.
The advantages and disadvantages of Nursing Minimum Data Sets for nursing practice are discussed, and the differences and commonalities of five international Nursing Minimum Data Set systems that exist or are in a well-advanced stage of development are described. It is concluded that there are differences in purpose, content, sampling, data collection, analysis and feedback methods.
This analysis illustrates the different data categories and items of a number of Nursing Minimum Data Set systems. These categories include: patient demographics, medical care items, nursing care elements, agency and provider items, episode-related items, and elements about resources. The nursing care elements usually include nursing diagnoses, interventions, and outcomes, but in one system only interventions are included.

Objective 6 ***Develop a Nursing Minimum Data Set for the Netherlands based on identified categories and items.***

We designed the Nursing Minimum Data Set for the Netherlands. We started the investigation because of the fact that no systematic collection of nursing care data exists in the Netherlands. Via a multi-method, exploratory approach the Nursing Minimum Data Set for the Netherlands was developed. Eight hospitals, with a total of sixteen wards, participated in the study.
The identified categories and items include: five setting and provider items, six patient demographics items, seven items describing the medical condition, ten nursing process items, twenty-four patient problems, thirty-two nursing interventions, four items reflecting outcomes of nursing care, and three complexity of care items.
The content validity of this set is supported by its consistency with the literature, findings from practice and the judgement of potential users. The categories are consistent with the systems developed elsewhere, although the number and nature of several items differ.

Objective 7 ***Try out the Nursing Minimum Data Set for the Netherlands for its usability to describe differences in patient populations and nursing activities.***

In chapter eight it is evaluated whether the Nursing Minimum Data Set for the Netherlands, as we developed it, is suitable for its purpose. Using paper-based forms, patient data were collected from 15 different hospital wards. During one week, nurses manually completed the list for every patient every day. The data analysis methodology from the Belgian Mimimale Verpleegkundige Gegevens was used [2, 3].
There were 686 individual patients included in the study. For the data analysis, their corresponding 2090 patient days in hospital were used. Frequencies of nursing phenomena, nursing activities and results of care were calculated, transformed into ridit scores, and presented graphically as 'fingerprints'. The applied methodology clearly shows what happens on the nursing wards.
It can be concluded that the Nursing Minimum Data Set for the Netherlands is able to represent, by means of the ridits and the fingerprints, the diversity of patient populations on the basis of nursing phenomena and the variation in nursing practice on the basis of nursing interventions. Therefore, the Nursing Minimum Data Set for the Netherlands has enough potential to be used on a larger scale for visualising nursing care.

Objective 8 ***Investigate aspects of reliability and validity of the Nursing Minimum Data Set for the Netherlands.***

The final study reports about a study towards the discriminative validity and the interrater reliability of the Nursing Minimum Data Set for the Netherlands. Data for the validity study were collected in an intensive care ward, in a nursing home, and in a residential home. These results were compared with those of the fifteen wards in the general hospital. The unit of measurement and analysis was again the 'patient day'. Analysis for validity consisted of ridit calculations and their graphical representations, illustrating differences in most nursing phenomena and nursing interventions.
Interrater reliability was measured in the residential home. The percentages agreement for the residential home vary from 60.4 % to 100%, and the Cohen's kappa statistics from -.09 to .85, indicating a poor to almost perfect interrater reliability.
As expected, intensive care patients and patients in the nursing home have in general more problems and need more nursing interventions compared to general hospital patients, while patients in the residential home have or need less of both.

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This illustrates the discriminative validity of the Nursing Minimum Data Set for the Netherlands on the level of the individual variables. The kappa values and interrater agreement for various variables are sufficiently high, although for several items it can be doubted if they are relevant for the residential home, and perhaps for every health care setting a core data set of nursing phenomena and nursing interventions needs to be selected.

In the different chapters of the thesis, more detailed conclusions are described. In the next section, the main conclusions about the studies as reported in this dissertation will be discussed.

10.3 Main conclusions of these studies

The analysis of the problems with nursing professional information management as presented in this thesis is, five years later, still valid. This situation means that during these five years the nursing profession in the Netherlands was not able to present adequate information about the care delivered and has not managed to use electronic patient records for its support. Thus, the potential benefits of nursing information for patients, nurses, and health care at large are not achieved yet. The goal of this thesis was to contribute to the strategic use of nursing information in the Netherlands. This is achieved via giving directions, providing means, and showing proof for the relevancy of the application of information and communication technology in nursing. For adequate nursing information management in the future, a research-based approach has been suggested, and three tools have been developed. These tools are:

1. A set of criteria for the inclusion of nursing information in electronic patient records,
2. The Nursing Information Reference Model, which allows selecting the relevant data for information system development and for the development of an information policy for the nursing profession,
3. The Nursing Minimum Data Set for the Netherlands, which presents useful information about the diversity of patient populations and variations in nursing practice.

Eventually, the application of these tools can contribute to adequate information management and processing by nurses, and to a competent recording and processing of nursing information in electronic patient records. Nevertheless, the tools require ongoing testing and application to achieve this.